

This listing of claims will replace all prior versions, and listing of claims in this application:

In the Claims:

1-56. (cancelled)

57. (Currently Amended) A combination of ingredients forming a retroreflective ink, the combination comprising metallised retroreflective elements, microbeads additional to said retroreflective elements and/or constituting said retroreflective elements at least in part, binder chemicals for attaching the retroreflective elements and microbeads to a substrate to which the ink is to be applied, ~~and~~ a coupling agent for coupling the microbeads and cross-linking the binder chemicals, and a buffer, the coupling agent being unreactive and uncured until a curing step is carried out and reactive when the curing step is carried out during which a temperature of the substrate and ink applied to the substrate is elevated to between 60 and 200°C, the coupling agent having a storage life of not less than about 3 months and being unreactive except at elevated temperature of the curing step, the coupling agent being selected from the group consisting of an aminoalkyl silanetriol and a blocked polyisocyanate.

58. (Cancelled)

59. (Previously Presented) The combination of claim 57 wherein at least some of the microbeads are without the retroreflective elements.

60. (Currently Amended) The combination of claim 57 wherein ~~the binder chemical and the coupling agent are selected from a group consisting of:~~ a polyvinylidene chloride copolymer is the binder chemical and ~~(3-aminopropyl)~~ a mixture of an aminoalkyl silanetriol and ~~or a blocked 1,6 hexamethylene diisocyanate trimer is the coupling agent~~ an acrylic copolymer is the binder chemical and (3-aminopropyl) silanetriol and/or blocked 1,6 hexamethylene diisocyanate trimer is the coupling agent, and a polyurethane is the binder chemical and blocked 1,6 hexamethylene diisocyanate trimer is the coupling agent.

61. (Currently Amended) The combination of claim 57 further comprising one or more components selected from the group consisting of:

pigment, ~~humectant, urea, urea and 2,3 propane diol, buffer, ammonium or sodium phosphates buffer~~, dispersant, defoamer, thickening agent, cross-linking agent, softening agent, carbon black, UV absorbing material, anti-scuffing agent, a silicone or fluoropolymer, light spill-suppressing agent, anti-static agent, water repellent agent, a silicone, and a fluoropolymer.

62. (Previously Presented) The combination of claim 57 wherein the volume ratio of the binder to the microbeads is equal to or less than 50%.

63. (Previously Presented) The combination of claim 57 wherein essentially all of the microbeads are unmetallised and the retroreflective elements include reflective flake particles.

64. (Previously Presented) The combination of claim 57 wherein the binder forms at least part of a liquid carrier medium for the retroreflective elements or microbeads.

65. (Previously Presented) The combination of claim 57 wherein the binder chemicals, retroreflective elements and microbeads are comprised of a one-pack retroreflective ink or a two-pack retroreflective ink having the coupling agent as the second pack.

66. (Previously Presented) The combination of claim 65 wherein the two-pack ink includes a reactive polyisocyanate or an alkoxysilyl alkyl derivative.

67. (Currently Amended) The combination of claim 57 wherein the microbeads are metallised with an aluminium coating that is superposed on a stannous chloride pre-treatment.

68. (Currently Amended) The combination of claim 67 wherein the metallised microbeads are treated with a solution of a silicate, followed by treatment with a silane compound selected from

~~the group consisting of a silicate, a sodium silicate, a silane, an amino silane, and a bis-[gamma-(trimethoxysilyl)propyl] amine.~~

69. (Currently Amended) The combination of claim 67 wherein the metallised microbeads are ~~treated~~ coated with an amino silane. ~~a silicate or silane that is superposed on the metallised microbeads.~~

70. (Previously Presented) A composition that a is one-pack or a two-pack retroreflective ink which is comprised of the combination claimed in claim 57.

71. (Currently Amended) The composition ~~combination~~ of claim 70 wherein the retroreflective ink is water-based.

72. (Currently Amended) The composition ~~combination~~ of claim 71 that is suitably formulated for screen printing.

73. (Currently Amended) The composition ~~combination~~ of claim 70 wherein the ink has a viscosity that is less than or equal to about 40 Pascal seconds at room temperature.

74. (Withdrawn) A composition that is microbeads for use in the production of a retroreflective ink, the microbeads having applied thereto one or more of the group comprising silicate, a silane, an amino silane, bis-[gamma-(trimethoxysilyl) propyl] amine and stannous chloride.

75. (Withdrawn) The composition of claim 74 wherein the microbeads are metallised with a coating of aluminium superposed on the stannous chloride.

76. (Withdrawn) The composition of claim 75 wherein the silicate is superposed on the metallised aluminium coated beads and the silane is superposed on the silicate.

77. (Withdrawn) The composition of claim 74 wherein the microbeads have one or more of the following characteristics selected from the group consisting of: a refractive index in the range of about 1.8 to 2.2, a median size of the microbeads in the range of about 10 to 100 microns and the microbeads are composed of titanium glass or barium glass.

78. (Withdrawn) A composition that is a retroreflective ink which contains microbeads as claimed in claim 74.

79. (Withdrawn) The composition of claim 77 which includes binder chemicals for attaching the microbeads to a substrate to which the ink is to be applied.

80. (Withdrawn) The composition of claim 79 which includes a coupling agent for coupling the microbeads and for cross-linking the binder chemicals, the coupling agent being unreactive until the printing process is carried out.

81. (Currently Amended) A method for making a one-pack retroreflective ink comprising the steps of:

- (a) making metallised microbeads;
- (b) suspending the microbeads in a liquid carrier medium, the liquid carrier medium is comprised of binder chemicals for attaching the microbeads to a substrate to which the ink is to be applied, ~~and~~ a coupling agent which couples the microbeads and cross-links the binder chemicals, and a buffer, the one-pack retroreflective ink having a storage life of not less than about 3 months and the coupling agent being unreactive and uncured until a curing step is carried out and reactive when the curing step is carried out during which a temperature of the substrate and ink applied to the substrate is elevated to between 60 and 200°C, the coupling agent having a storage life of not less than about 3 months and being unreactive except at elevated temperature of the curing step, the coupling agent being selected from the group consisting of an aminoalkyl silanetriol and a blocked polyisocyanate.

82. (Previously Presented) The method of claim 81 wherein step (a) includes applying an aluminium coating to the microbeads.

83. (Previously Presented) The method of claim 82 wherein step (a) includes pre-treating the microbeads with stannous chloride prior to application of the aluminium coating.

84. (Previously Presented) The method of claim 83 wherein step (a) includes treating the microbeads with a dilute aqueous solution of stannous chloride.

85. (Previously Presented) The method of claim 81 wherein step (a) includes hemispherically metallising the microbeads in a vacuum metallising process in which the microbeads are held on a film with an adhesive coating for transport through the metallising process, the adhesive coating is comprised of styrene-butadiene type adhesive.

86. (Previously Presented) The method according to claim 85, wherein step (a) includes passing the film through an aqueous solution of citric acid after metallisation.

87. (Previously Presented) The method of claim 85 wherein step (a) includes ultrasonically treating the film to assist in release of the microbeads from the adhesive.

88. (Previously Presented) The method of claim 84 wherein step (a) includes treating the microbeads prior to inclusion in the ink with a silicate.

89. (Previously Presented) The method of claim 81 wherein step (a) includes treating the microbeads with a silane or an amino silane prior to inclusion in the ink.

90. (Currently Amended) The method of claim 88 wherein step (a) includes treating the microbeads with a compound selected from the group consisting of a silane, an amino silane and bis-[~~gamma~~-(trimethoxysilyl) propyl] amine after the silicate treatment.

91. (Cancelled)

92. (Currently Amended) The method of claim 81 wherein step (a) (b) includes preparing the liquid carrier medium from the binder chemicals and the coupling agent before suspending the microbeads in the liquid carrier medium.

93. (Currently Amended) The method of claim 92 wherein the liquid carrier medium of step (b) includes additives selected from the group consisting of:

pigment, ~~humectant, urea, urea and 2,3 propane diol, buffer, ammonium or sodium phosphate buffer~~, dispersant, defoamer, thickening agent, cross-linking agent, softening agent, carbon black, UV absorbing material, anti-scuffing agent, silicone, fluoropolymer, light spill-suppressing agent, anti-static agent and water repellent agent.

94. (Previously Presented) The method of claim 93 wherein step (b) includes adding a thickener to the liquid carrier medium before or after the addition of the binder chemicals and coupling agent.

95. (Previously Presented) A composition of an ink produced by the method of claim 81.

96. (Previously Presented) A composition of a substrate coated or printed with a composition of claim 95.

97. (Previously Presented) The composition of claim 96 wherein the substrate is a screen for displaying projected images or a studio background for chroma-keying applications.

98. (Previously Presented) The composition of claim 96 wherein the substrate is a flexible tape.

99. (Previously Presented) The method of providing a substrate having a retroreflective coating, comprising the steps of:

applying to the substrate an ink as claimed in claim 95 wherein the ink is formulated as a one-pack retroreflective ink and the coupling agent is activated after the ink is printed or coated on to the substrate.

100. (Previously Presented) The method of claim 99 wherein the coupling agent is activated by curing the ink coating at elevated temperature.

101. (Previously Presented) The method of claim 99 wherein the coupling agent is activated by UV light or other high energy radiation during or after the printing process.

102. (Previously Presented) The composition of claim 95 wherein the ink is a retroreflective one-pack ink having a storage life of not less than about 3 months.

103. (Previously Presented) The composition of claim 102 wherein the retroreflective one-pack ink has a viscosity of between about 10 and 30 Pascal seconds after storage of not less than about 3 months.

104. (Previously Presented) The composition of claim 102 wherein the retroreflective one-pack ink applied to the substrate and cured has a laundering durability such that the retroreflectivity is not reduced by more than about 40% when the substrate is in the form of a cotton, nylon or polyester fabric and laundered for 5 cycles in accordance with ISO 6330, method 5A.

105. (Withdrawn) A composition of a fabric having fireproof or fire retardant properties that is printed or coated with a retroreflective ink which is comprised of retroreflective elements in a polymeric matrix, the fabric comprising a structural component that chars before it melts.

106. (Withdrawn) The composition of claim 105 wherein the fabric is made fireproof or fire retardant by application of a fire retardant agent.

107. (Withdrawn) The composition of claim 106 wherein the fire retardant agent is applied to a cellulosic, the fire retardant agent is selected from the group consisting of Proban RTM and Pyrovatex RTM.

108. (Withdrawn) The composition of claim 105 wherein the fabric is comprised of an aramid fiber.

109. (Withdrawn) The composition of claim 105 wherein the fabric is non-burning after a retroreflective ink has been applied to the fabric.

110. (Withdrawn) The composition of claim 109 wherein the ink is aqueous-based and the polymeric matrix comprises polyvinylidene chloride.

111. (Withdrawn) The composition of claim 111 wherein the polymeric matrix comprises polyvinyl chloride or other non-flammable plastisol.

112. (Withdrawn) A composition that is a fireproof or fire retardant fabric printed or coated with a retroreflective ink which is comprised of retroreflective elements in a polymeric matrix, the fabric is comprised of a structural component that chars before it melts, the ink is comprised of a ink as claimed in claim 70.

113. (Previously Presented) The composition of claim 57, wherein the coupling agent has a storage life of not less than about 3 months and is unreactive except at elevated temperature of between 130 and 180°C at which the one-pack retroreflective ink printed on the substrate is cured.

114. (Previously Presented) The method of claim 81, wherein the coupling agent has a storage life of not less than about 3 months and is unreactive except at elevated temperature of between 130 and 180°C at which the one-pack retroreflective ink printed on the substrate is cured.

115. (Previously Presented) The combination of claim 68 wherein the microbeads have at least one of the following characteristics selected from the group consisting of: a refractive index in the range of about 1.8 to 2.2, a median size of the microbeads in the range of about 10 to 100 microns and the microbeads are composed of titanium glass or barium glass.

116. (Previously Presented) The method of claim 90 wherein the microbeads have at least one of the following characteristics selected from the group consisting of: a refractive index in the range of about 1.8 to 2.2, a median size of the microbeads in the range of about 10 to 100 microns and the microbeads are composed of titanium glass or barium glass.

117. (Currently Amended) A combination of ingredients forming a retroreflective ink, the combination comprising retroreflective elements, microbeads additional to said retroreflective elements and/or constituting said retroreflective elements at least in part, binder chemicals for attaching the retroreflective elements and microbeads to a substrate to which the ink is to be applied, and a coupling agent for coupling the microbeads and cross-linking the binder chemicals, the coupling agent being unreactive and uncured until a curing step is carried out and reactive when the curing step is carried out during which a temperature of the substrate and ink applied to the substrate is elevated to between 60 and 200°C, the coupling agent having a storage life of not less than about 3 months and being unreactive except at elevated temperature of the curing step, the coupling agent being selected from a group consisting of an aminoalkyl silanetriol and a combination of aminoalkyl silanetriol and blocked polyisocyanate and wherein the ink retains a viscosity of between 10 and 30 Pascal seconds for not less than 3 months.

118. (Currently Amended) A method for making a one-pack retroreflective ink comprising the steps of:

- (a) making metallised microbeads;
- (b) suspending the microbeads in a liquid carrier medium, the liquid carrier medium is comprised of binder chemicals for attaching the microbeads to a substrate to which the ink is to be applied and a coupling agent which couples the microbeads and cross-links the binder chemicals, the one-pack retroreflective ink having a storage life of not less

than about 3 months and the coupling agent being unreactive and uncured until a curing step is carried out and reactive when the curing step is carried out during which a temperature of the substrate and ink applied to the substrate is elevated to between 60 and 200°C, the coupling agent having a storage life of not less than about 3 months and being unreactive except at elevated temperature of the curing step, the coupling agent being selected from a group consisting of an aminoalkyl silanetriol and a combination of aminoalkyl silanetriol and block polyisocyanate; and

wherein the ink retains a viscosity of between 10 and 30 Pascal seconds for not less than 3 months.

119. (New) The combination of ingredients according to claim 57 wherein the buffer is a phosphate buffer.

120. (New) The combination of ingredients according to claim 119 wherein the phosphate buffer is an ammonium phosphate buffer.

121. (New) The combination of ingredients according to claim 119 wherein the phosphate buffer is a sodium phosphate buffer.

122. (New) The combination of ingredients according to claim 57 wherein the binder is a polyvinylidene chloride copolymer and the coupling agent is an aminoalkyl silanetriol.

123. (New) The combination of ingredients according to claim 57 wherein the binder is an acrylic copolymer and the coupling agent is an aminoalkyl silanetriol.

124. (New) The combination of ingredients according to claim 57 wherein the binder is polyurethane and the coupling agent is a blocked hexamethylene diisocyanate trimer.

125. (New) The combination of ingredients according to claim 57 wherein the binder is a non-flammable plastisol.

126. (New) The combination of claim 125 wherein the non-flammable plastisol is polyvinylidene chloride.

127. (New) The combination of claim 125 wherein the non-flammable plastisol is polyvinyl chloride.

128. (New) The combination of ingredients according to claim 57 additionally including a humectant.

129. (New) The combination of ingredients according to claim 128 wherein the humectant is urea.

130. (New) The combination of ingredients according to claim 128 wherein the humectant is a combination of urea and 2,3 propane diol.

131. (New) The combination of claim 57 wherein the combination comprises a one pack retroreflective ink.

132. (New) The composition of claim 70 wherein the ink has a viscosity of between 10 and 30 Pascal seconds at room temperature.

133. (New) The method of claim 81 wherein the liquid carrier medium of step (b) includes a phosphate buffer.

134. (New) The method of claim 133 wherein the phosphate buffer is an ammonium phosphate buffer.

135. (New) The method of claim 133 wherein the phosphate buffer is a sodium phosphate buffer.

136. (New) The method of claim 81 wherein the liquid carrier medium of step (b) additionally includes a humectant.

137. (New) The method of claim 136 wherein the humectant is urea.

138. (New) The method of claim 136 wherein the humectant is a combination of urea and 2,3 propane diol.

139. (New) The method of claim 81 wherein the binder of the liquid carrier medium is a non-flammable plastisol.

140. (New) The method of claim 139 wherein the non-flammable plastisol is polyvinylidene chloride.

141. (New) The method of claim 139 wherein the non-flammable plastisol is polyvinyl chloride.